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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/732,863	12/09/2003	Mason K. Harrup	B-214	8133

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EXAMINER

POULOS, SANDRA K

ART UNIT	PAPER NUMBER
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1714

DATE MAILED: 10/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/732,863

Applicant(s)

HARRUP ET AL.

Examiner

Sandra K. Poulos

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 5, 6, 8-18, 20, 21, 23-34, 36, 37, 39-53 and 55-59 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9-15 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 6, 8, 16-18, 20, 21, 23-28, 30, 32-34, 36, 37, 39, 40, 42-53 and 55-59 is/are rejected.
- 7) ☒ Claim(s) 29, 31 and 41 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. All outstanding rejections and objections except for those described below are overcome by applicant's amendment filed 7/31/06.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

The new grounds of rejection set forth below are necessitated by applicant's amendment filed 7/31/06. In particular, claims 1, 16, 32, and 49 have been amended so that the polymer component and the inorganic oxide form an interpenetrating network, and that the polymer is limited to PAN, PEO, PEG, PVA, or polyvinyl acetate, and that the metal ion sequestration constituent is uniformly distributed through the interpenetrating network, wherein this combination of limitations were not presented in the previous claims. Thus the following action is properly made FINAL.

Claim Rejections - 35 USC § 103

2. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Payzant (US 6,610,780) in view of Sievers (US 2002/0032272).

Payzant discloses a networked polymer clay alloy wherein the polymer is used to enhance a product's water absorbency (col 1, lines 21-29). The clays are swelling clays such as montmorillonite and silica, which have metal oxides components (col 6, line 59 to col 7, line 22). Metal complexing agents are used as additives, to form metal complexes and thereby sequestering metal ions (col 8, lines 6-25). When the clay is intercalated with monomer, the composition is a nanocomposite (col 2, lines 13-24); it is

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formed from a homogeneous mixture (col 14, lines 39-40). The polymer-clay alloy has water absorbing and/or permeability properties that are desired for the intended use (col 14, lines 15-20).

Payzant does not disclose that (1) the polymer is PAN, PEO, PEG, PVA, or polyvinyl acetate, (2) an interpenetrating network, or (3) the metal ion sequestration constituent is uniformly distributed through the interpenetrating network.

Sievers discloses a nanocomposite material with an interpenetrating network of organic polymer and silicon dioxide (abstract). It is produced by mixing aqueous solutions or dispersions of organic polymers capable of forming polymer networks in aqueous phase, polymer precursors or mixtures thereof and silicon dioxide components and forming into an interpenetrating network (abstract). Water is preferably the solvent, but others may be used (para 38). Hydrophilic polymers such as PVA, polyvinyl acetate, and PEG are used (para 14). The composition is useful as an adsorbent, has good barrier properties, and is suitable for as a base material for membranes (para 52-54). It would have been obvious to one of ordinary skill in the art to use PVA, PEG, or polyvinyl acetate and to use an interpenetrating network such as in Sievers in order inexpensively create a uniform mixture of the components which combine the properties of the polymer with those of the inorganic ceramic (para 2, 5-7). Additionally, it would have been obvious to one of ordinary skill in the art that the metal ion sequestration constituent would be uniformly distributed throughout the material because an asymmetrical membrane would not block the flow of contaminants to the extent that a

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homogeneous barrier would because it, in random parts, would be less selectively permeable to the metal ion.

3. Claims 1-3, 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sievers (US 2002/0032272) in view of Sebesta (Composite Ion Exchanger with Ammonium Molybdophosphate and Its Properties).

Sievers discloses a nanocomposite material with an interpenetrating network of organic polymer and silicon dioxide (abstract). It is produced by mixing aqueous solutions or dispersions of organic polymers capable of forming polymer networks in aqueous phase, polymer precursors or mixtures thereof and silicon dioxide components and forming into an interpenetrating network (abstract). Water is preferably the solvent, but others may be used (para 38). Hydrophilic polymers such as polyvinyl alcohol, polyvinyl acetate, and polyethylene glycol are used (para 14). The composition is useful as an adsorbent, has good barrier properties, and is suitable for as a base material for membranes (para 52-54).

Sievers does not disclose a metal ion sequestration constituent uniformly distributed through the interpenetrating network.

Sebesta discloses an organic binding polymer used in the preparation of membranes or exchanger with the use of AMP to remove cesium from liquid waste (pages 15-16). It would have been obvious to one of ordinary skill in the art to add AMP to the interpenetrating network in Sievers in order to produce a membrane than can

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effectively remove cesium waste from water and to distribute uniformly so that the cesium uptake will be increased.

4. Claims 1-3, 5, 16-18, 20, 32-34, 36, 49, 52-53, 55, 57-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson et al (Synthesis, Characterization, and Ion Sequestration of Novel Nanocomposite Materials) in view of Sievers (US 2002/0032272).

Polson discloses nanocomposites which combine water-soluble polymers with ceramics. Ceramics are composed mainly of silicon dioxide (Hawley's Condensed Chemical Dictionary). The nanocomposite is considered for subsurface remediation through the formation of an *in-situ* permeable reactive barrier. The physical stabilization can be deliberately altered to adjust the properties of the composite to those required for subsurface applications. Animomolybdophosphate is used as a selective cesium capturing agent (metal ion sequestration constituent).

Polson does not disclose that (1) the polymer is PAN, PEO, PEG, PVA, or polyvinyl acetate, (2) an interpenetrating network, or (3) the metal ion sequestration constituent is uniformly distributed through the interpenetrating network.

Sievers discloses a nanocomposite material with an interpenetrating network of organic polymer and silicon dioxide (abstract). It is produced by mixing aqueous solutions or dispersions of organic polymers capable of forming polymer networks in aqueous phase, polymer precursors or mixtures thereof and silicon dioxide components and forming into an interpenetrating network (abstract). Water is preferably the solvent,

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but others may be used (para 38). Hydrophilic polymers such as PVA, polyvinyl acetate, and PEG are used (para 14). The composition is useful as an adsorbent, has good barrier properties, and is suitable for as a base material for membranes (para 52-54). It would have been obvious to one of ordinary skill in the art to use PVA, PEG, or polyvinyl acetate and to use an interpenetrating network such as in Sievers in order inexpensively create a uniform mixture of the components which combine the properties of the polymer with those of the inorganic ceramic (para 2, 5-7). Additionally, it would have been obvious to one of ordinary skill in the art that the metal ion sequestration constituent would be uniformly distributed throughout the material because an asymmetrical membrane would not block the flow of contaminants to the extent that a homogeneous barrier would because it, in random parts, would be less selectively permeable to the cesium.

5. Claims 4, 6, 8, 19, 21, 30, 35, 37, 39, 54, 56, 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Sievers as applied to claims 1-3, 5, 7, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58 above, and further in view of Mann et al in US 2002/0121470 or Sebesta et al (Composite Ion Exchanger with Ammonium Molybdophosphate and its Properties).

The discussion with respect to Polson in paragraph 4 above is incorporated herein by reference.

Polson discloses aminomolybdophosphate and other selective cesium capturing agents, but not specifically ammonium molybdphosphate.

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Mann discloses a composite media suitable for facilitating removal of various ions from fluid streams (para 4). The material is able to remove ions such as cesium from water (para 23). Among the active components are ammonium molybdophosphate (AMP) (para 59) which are incorporated into a hydrophilic polymer matrix.

Sebesta discloses an organic binding polymer used in the preparation of membranes or exchanger with the use of AMP to remove cesium from liquid waste (pages 15-16).

It would have been obvious to one of ordinary skill in the art to use AMP in Polson, which is open to other cesium capturing agents other than aminomolybdophosphate, because Mann and Sebesta disclose the effectiveness of AMP in removing Cs and it is well settled that it is prima facie obvious to combine two ingredients, each of which is targeted by the prior art to be useful for the same purpose. *In re Lindner* 457 F.2d 506, 509, 173 USPQ 356, 359 (CCPA 1972).

6. Claims 24-28, 44-48, and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Sievers as applied to claims 1-3, 5, 16-18, 20, 32-34, 36, 49, 52-53, 55, 57-58 above, and further in view of EPA/600/R-98/125 (Permeable Reactive Barrier Technologies for Contaminant Remediation).

The discussion with respect to Polson in paragraph 4 above is incorporated herein by reference. Polson does not go into detail with respect to where the permeable reactive barrier would be located.

EPA discloses a method of remediating groundwater through the use of a permeable reactive barrier (PRB) (pg 1). Figure 1 on page 1 shows how the PRB is used, and it is to be noted that Figure 1 is identical to Figure 6 of the current application, wherein it is disclosed that "Fig. 6 illustrates the use of the nanocomposite materials of the present invention to remediate contaminated groundwater." EPA discloses that PRBs are currently built with two basic configurations, the funnel-and-gate and the continuous PRB (pg 1). Both have required some degree of excavation and have been limited in depth (pg 1). Newer techniques for emplacing reactive media such as injection of slurries may serve to overcome some of the emplacement limitations (pg 1). The funnel and gate design uses impermeable walls to direct the plume flow to the PRB and has a greater impact on altering groundwater flow than does continuous PRB (pg 1). The type of continuous PRB most commonly installed is a trench that has been excavated (pg 36). The trench is in the saturated zone (pg 37). There can be supporting trenches also installed (pg 38-39). The PRBs disclosed by the EPA are iron metal PRBs (pg 1).

It would have been obvious to one of ordinary skill in the art to use the PRB of Polson in the configurations given by the EPA because the given configurations have been in use and have shown successful decontamination of groundwater. One would expect reasonable success because both are PRBs used for removing contaminants from groundwater.

It would have been obvious to one of ordinary skill in the art to locate the PRB of Polson in an excavated trench in the groundwater table because it is the most

commonly installed continuous trench. Additionally, it would have been obvious to use supporting trenches for support. Furthermore it would have been obvious to also use a funnel and gate configuration because the impermeable walls would direct the plume flow to the PBR so that the water could be treated.

7. Claims 23, 40, 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Sievers as applied to claims 1-3, 5, 16-18, 20, 32-34, 36, 49, 52-53, 55, 57-58 above, and further in view of Gilmore et al (US 2001/0033772).

The discussion with respect to Polson in paragraph 4 above is incorporated herein by reference. Polson does not disclose use of a PBR/nanocomposite in the vadose zone.

Gilmore discloses a reactive barrier for control of contaminated soil and groundwater (pg 1). A reactive barrier used to alleviate the spreading of groundwater contamination and vadose zone contamination (pg 1, paragraph 9-10). The contaminants that treated are metals, organics, and radionuclides (pg 2, paragraph 23). Gilmore discloses that there has also been some success in using reactive barriers in trenches (pg 1, paragraph 8).

It would have been obvious to one of ordinary skill in the art to use PBR/nanocomposite of Polson and apply it to the vadose zone as disclosed by Gilmore because both are used in remediation of contaminated water. One would expect reasonable success in using the PBR in the vadose zone because Gilmore discloses that reactive barriers can be used both in the vadose zone and in the groundwater.

8. Claims 42, 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Sievers as applied to claims 1-3, 5, 16-18, 20, 32-34, 36, 49, 52-53, 55, 57-58 above, and further in view of Conner et al (US 5,728,302).

The discussion with respect to Polson in paragraph 4 above is incorporated herein by reference. Polson does not disclose injecting a slurry of the nanocomposite dispersed in a liquid in order to form a membrane in the ground.

Conner discloses a method of reducing the concentration of radioactive contaminants in fluids from subterranean reservoirs by directly introducing a solid sorbant into the reservoir as a solid component of a solid-liquid slurry using high pressure injection techniques (abstract; col 2, lines 39-67). The resin is mixed with an appropriate injection fluid and subsequently introduced into the reservoir (col 3, lines 28-35). The injection fluid is most commonly water (col 7, lines 14-22). Solid sorbants such as oxides of zirconium and titanium may be employed for removal of dissolved radionuclides (col 5, lines 27-35).

It would have been obvious to one of ordinary skill in the art to use the nanocomposite of Polson inject it into the ground as a slurry of particles as disclosed by Conner because both are used in subsurface remediation of groundwater. One would expect reasonable success because both compositions comprise a resin and oxide and remove contaminants from groundwater, thereby obtaining the invention as set forth in the presently cited claims.

Response to Arguments

9. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Allowable Subject Matter

10. Claims 9-15 are allowed. Claims 29, 31, 41 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sandra K. Poulos whose telephone number is (571) 272-6428. The examiner can normally be reached on M-F 8:00-4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on (571) 272-1119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SKP

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